

TMO TECHNOLOGY DEVELOPMENT PLAN

Spacecraft Radio Systems Work Area

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OBJECTIVE:

Achieve significant reduction in spacecraft telecom hardware* cost mass and volume and DC power while providing flexibility, increased performance and assure compatibility with the DSN.

*(X/Ka-Band antennas, power amplifiers and transponding modems)

GOALS and SIGNIFICANCE:

One of the work area goals is to develop an X/Ka-Band transponding modem (STM) to meet future mission needs. The significance this goal is that enhanced transponder telecom services* will be provided at significantly less cost (in dollars, mass and volume and DC power) for future missions.

*(tracking, command, telemetry, navigation, timekeeping)

Another work area goal is to develop an adaptive inflatable Ka-Band transmit antenna. The significance of this goal is that improved downlink telemetry data return will be provided at significantly less cost (in dollars, mass and volume and DC power) for future missions.

A third work area goal is to develop high efficiency Ka-Band power amplifiers. The significance of this goal is that improved downlink telemetry data return will be provided at significantly less cost (in dollars, mass and volume and DC power) for future missions.

PRODUCTS:

One of the work area products is a prototype X/Ka Transponding Modem. The potential user's/customers are Mars '03, Pluto, Europa, Solar Probe, DS-3, and DS-4. The approach is to utilize 3 RF MCMs, a single mixed mode ASIC, and digital signal processing software.

Another work area product is a prototype 3 meter Ka-Band adaptive inflatable antenna. The potential user's/customers are Mars '03, Pluto, Europa, Solar Probe, DS-3, and DS-4. The approach is to extend the techniques developed previously in FY 96 and FY 97 for the 0.5 meter Ka-Band reflectarray, and the 1 meter X-Band inflatable reflectarray antennas to develop a 3 meter Ka-Band antenna which provides an electronic beam steering capability. The Ka-Band downlink beam will be steered by spacecraft commands relayed by the STM to control an array of Ka-Band amplifiers in the transmit antenna.

A third product of the work area is a high efficiency Ka-Band power amplifier. The potential user's/customers are Mars '03, Pluto, Europa, Solar Probe, DS-3, and DS-4. The approach is to continue the development of the Class E amplifier study begun in FY 97, work with TAP-sponsored engineers to develop high efficiency amplifiers in FY 98. Prepare for Quasi-optical amplifier and high efficiency Ka-Band TWTA developments planned for FY 99.

DESCRIPTION:

The long term objectives of the spacecraft radio systems work area is to develop advanced flight telecom hardware* for future missions.

*(antennas, power amplifiers and transponding modems)

The radio hardware will be developed to minimize parts count, mass and volume, and DC power, flexibly accommodate customer requirements, provide standardized end-to end telecom services. Emphasis will be placed on providing modularity in the design of the hardware and software elements and key feature of the software radio epitome.

The STM work are will evolve to maximize the number of functions performed digitally and optimize the partitioning of functions and performance between hardware and software, and incorporate system-on-a chip (SOAC) technology to develop a single-deck modem.

The Ka inflatable adaptive antenna work are will evolve to include a beam-pointing processor, an adaptive pointing algorithm, improve the efficiency of the antenna to above 60%, and integrate a high efficiency Ka-Band transmit amplifier array as part of the antenna.

The high efficiency amplifier task will evolve to produce Ka-Band amplifiers with efficiencies in excess of 70% and output power level from 5 Watts to 20 Watts RF.

DELIVERABLES:

X/Ka Transponding Modem Prototype	9/00
Ka-Band Inflatable Adaptive Transmit Antenna Prototype	9/99
Inflatable antenna Technology Study Results	9/01
High Efficiency Ka-Band TWTA Prototype	9/00
Quasi-Optic Ka-Band Power Amplifier Prototype	9/00

RESOURCE REQUIREMENTS BY WORK UNIT:

	JPL Account #	FY98	FY99	FY00	FY01	FY02	FY03
STM	462-422xx	1400					
Ka 3m Reflectarray	462-42204	150					
Inflatable Ant	462-42015	150					
Work Area Total	462-42xxx	1700	1600	1550	1500	1557	1557
Total Workforce	462-42xxx						

TMO TECHNOLOGY TASK DESCRIPTION

TITLE: This should be the same as the title of the proposal which was funded

WORK UNIT IN WHICH FUNDED: Put the title of the work unit, and the JPL account number, here

WORK AREA: Name of Work Area

BRIEF TECHNICAL SUMMARY:

If your proposal was funded 100%, this will be the same as in the proposal. If it was funded less than 100%, it should be adjusted accordingly.

JUSTIFICATION AND BENEFITS:

Same thing here.

APPROACH AND PLAN:

And here

DELIVERABLES:

These should be the deliverables on the proposal. None should be left out unless there has been negotiation to leave it out, e.g. if the proposal was not funded 100%.

RESOURCE REQUIREMENTS:

	Prior Year	FY98	FY99	FY00	FY01	Total at Completion
<i>Funding (\$K)</i>						0
<i>Workforce (WY)</i>						0
<i>Co-funding (\$K)</i>						0
<i>Projected Savings (\$K)</i>						0